

CLAIMS

1. An ultrasonic welding assembly comprising a horn and an anvil, wherein said horn comprises two prongs separated by a gap, each of said prongs comprising an end surface confronting said anvil, each of said end surfaces having at least a portion that is flat, said flat portions being generally coplanar.

2. The assembly as recited in claim 1, wherein each of said prongs further comprises a respective rail projecting forward of said respective end surface, said rail being shaped to serve as a dam for flowing thermoplastic material.

3. The assembly as recited in claim 2, wherein each of said prongs further comprises an energy director designed to direct ultrasonic energy into a mass of thermoplastic material and deflect flowing thermoplastic material of said mass toward said dam.

4. A method for forming slider end stops on a zipper tape that comprises first and second interlockable zipper parts, comprising the following steps:

(a) transmitting sufficient ultrasonic wave energy into first and second areas of said zipper tape to cause said first and second interlocked zipper parts to deform and fuse in said first and second areas, said first and second areas being separated by a gap; and

(b) applying sufficient heat and pressure onto a third area of said zipper tape to cause said interlocked zipper parts to deform and fuse in said third area, at least part of said third area being located between said first and second areas in said gap.

5. The method as recited in claim 4, further comprising the step of joining said zipper tape to opposing walls of packaging film material prior to said step (a).

6. The method as recited in claim 4, further comprising the step of mounting a slider to a portion of said zipper tape.

5 7. The method as recited in claim 5, further comprising the step of: (c) applying sufficient heat and pressure onto a fourth area to form a seal that extends generally transverse to a lengthwise direction of said zipper tape, wherein said fourth area encompasses a portion of said zipper tape and opposed packaging film, said third and fourth areas are contiguous, and steps (b) and (c) are performed concurrently in one operation.

10 8. The method as recited in claim 4, wherein rails of said interlocked zipper parts overlap said third area but not said first and second areas, said rails being deformed in said third area.

9. The method as recited in claim 4, further comprising the step of cutting said zipper tape and said packaging film material along a line that passes through said third and fourth areas, but not said first and second areas.

15 10. The method as recited in claim 9, wherein said cutting line substantially bisects said third and fourth areas.

11. A system for forming slider end stops on a zipper tape that comprises first and second interlockable zipper parts, comprising:

20 an ultrasonic welding apparatus configured to transmit sufficient ultrasonic wave energy into first and second areas of said zipper tape to cause said first and second interlocked zipper parts to deform and fuse in said first and second areas, said first and second areas being separated by a gap; and

25 a conduction heat sealing apparatus configured to apply sufficient heat and pressure onto a third area of said zipper tape to cause said interlocked zipper parts to deform and fuse in said third area, at least part of said third area being located between said first and second areas in said gap.

ITW-13119

12. The system as recited in claim 11, wherein said conduction heat sealing apparatus is also configured to apply sufficient heat and pressure onto a fourth area to form a seal that extends generally transverse to a lengthwise direction of said zipper tape, wherein said third and fourth areas are contiguous.

13. The system as recited in claim 12, further comprising means for cutting said zipper tape along a line that passes through said third and fourth areas, but not said first and second areas.

14. The system as recited in claim 13, wherein said cutting line substantially bisects said third and fourth areas.

15. The system as recited in claim 11, wherein said ultrasonic welding apparatus comprises a horn and an anvil, said horn comprising two prongs separated by a gap, each of said prongs comprising an end surface confronting said anvil, each of said end surfaces having at least a portion that is flat, said flat portions being generally coplanar.

16. The system as recited in claim 11, wherein said conduction heat sealing apparatus comprises a pair of mutually aligned and opposing sealing bars situated on opposing sides of said zipper tape.

17. The system as recited in claim 12, wherein a center of said ultrasonic welding apparatus and a center of said conduction heat sealing apparatus are separated by a distance equal to a width of a package.

18. The system as recited in claim 13, wherein a center of said ultrasonic welding apparatus, a center of said conduction heat sealing apparatus and said cutting means are spaced at increments equal to a width of a package.

19. A method for forming slider end stops, comprising the following steps:

ITW-13119

advancing a web of packaging film material having a zipper tape joined thereto to a first station;

at said first station, ultrasonically stomping said zipper tape in first and second areas, said first and second areas being separated by a gap;

5                    advancing said web by one package width in a lengthwise direction of said zipper tape so that said gap is in register with a second station; and

10                    at said second station, conduction heat sealing in a third area that lies at least partly in said gap between said first and second areas and includes a contiguous strip that extends generally transverse to said lengthwise direction, a portion of said zipper tape within said third area being deformed and portions of said packaging film material within said third area being joined to form a seal having a predetermined width.

15                    20. The method as recited in claim 19, further comprising the steps of:

advancing said web by one package width in said lengthwise direction so that said third area is in register with a cutting instrument at a third station; and

20                    at said third station, cutting said zipper tape and said packaging film material along a straight line intersecting and dividing said third area to separate a package.

21. The method as recited in claim 19, further comprising the step of joining said zipper tape to opposing walls of said packaging film material prior to said first advancing step.

25                    22. The method as recited in claim 19, further comprising the step of mounting a slider to a portion of said zipper tape.

ITW-13119

23. The method as recited in claim 19, wherein said zipper comprises first and second rails, said rails being deformed during said conduction heat sealing step, but not during said ultrasonic stamping step.

5 24. An apparatus for forming packages having slider-operated zippers, comprising first and second stations having respective registration points spaced at a distance equal to one or more package widths along a machine direction, wherein:

10 said first station comprises an ultrasonic welding apparatus configured to ultrasonically stomp a zipper tape in first and second areas spaced in said machine direction, said first and second areas being separated by a gap; and

15 said second station comprises conduction heat sealing apparatus configured to heat seal packaging film material in a third area that lies at least partly in said gap between said first and second areas and includes a contiguous strip that extends generally transverse to said machine direction, a portion of said zipper tape within said third area being deformed and portions of said packaging film material within said third area being joined to form a seal having a predetermined width.

20 25. The apparatus as recited in claim 24, further comprising a third station having a registration point spaced at a distance equal to one or more package widths along said machine direction from said registration point of said second station, wherein said third station comprises a cutting device for cutting said zipper tape and said packaging film material along a straight line intersecting and dividing said third area to separate a package.

25 26. The apparatus as recited in claim 24, wherein said ultrasonic welding apparatus comprises a horn and an anvil, said horn comprising two prongs separated by a gap, each of said prongs comprising an end surface confronting said anvil, each of said end surfaces having at least a portion that is flat, said flat portions being generally coplanar.

ITW-13119

27. The apparatus as recited in claim 24, wherein said conduction heat sealing apparatus comprises a pair of mutually aligned and opposing sealing bars situated on opposing sides of said zipper tape and said packaging film material.